Installation Instructions

Operators Manual

TEMPEST™ excellence

OVERHAULED 200 , 3200 , 240 , 400 Series Dry Air Pumps

Aero Accessories, Inc.
1240 Springwood Avenue Gibsonville, N.C. 27249 USA

FAA Approved Overhaul

WARNING CAUTION ATTENTION

DO NOT: use teflon tape or any other type of thread sealant or compound on the threaded fittings or ports of this pump. Extremely close internal tolerances will not permit ingestion of anything but clean air into this unit without failure occuring.

REPAIR: any oil leak, however slight, that will permit oil to reach the drive end of the pump or the inlet filter(s). Any oil which enters the pump, even one drop, may cause failure.

CLEAN OUT: all lines and hoses, change filters and clean regulators after failure of a dry air pump before installing the replacement dry air pump.

DO NOT: cut rubber hose lining on metal fitting edges while slipping hoses onto fittings. A piece of rubber hose liner as small as a grain of sand will easily cause pump failure.

Better than 95% of all dry air pumps returned for premature failure are the results of one of the above mentioned conditions

Rear Cover Wear Indicator Port Instructions 200 & 3200 Series

215CC, 215CC-9, 216CW, AA215CC, AA215CC-9, AA216CW, AA3215CC, AA3215CC-9, & AA3216CW Overhauled Dry Air Pumps

Aero Accessories, Inc. has FAA approval to install its patented rear cover Wear Indicator Port in overhauled Airborne 215CC and 216CW dry air pumps as well as AA215CC, AA216CW, AA3125CC, and AA3216CW overhauled dry air pumps.

Removing the port plug allows for a visual observation to determine vane wear. The end of the vane closest to the center of the rotor may be viewed through the small indicator hole in the port area, refer to observation procedure on page 4.

The Rear Wear Port Indicator is a visual aid in determining vane length at recommended observation intervals. Individual findings while conducting observations do not constitute the actual remaining life of the pump. Components of an aircraft can and do fail at anytime without warning. During the typical service life of a pump, it's vane length can become a critical factor in determining the remaining life of the pump. The vane length will be reduced by normal wear to a point that it may bind in a rotor slot and break, causing pump failure. The Rear Wear Indicator Port is designed as an aid to help monitor vane length.

For additional information refer to Aero Accessories, Inc Service Letter SL-004, available on www.aero-accessories.com

Failure of an air pump may result in the loss of the pneumatically powered gyro flight instruments. IMC equipped aircraft should have a pneumatic or electric backup source in the event the aircraft's primary pump fails.

200 Series Overhauled Pumps Equipped with WIP

Recommended Rear WIP Vane Wear Observation Procedure

1st Observation 600 hours time-in-service

Next Observation(s) should be made as deemed necessary based on vane wear rate observed.

At 600 hours pump service life perform a visual observation of the wear port indicator. If the top of the vane has not entered the indicator hole, the next observation should be performed at 1000 hours of pump service life.

At 600 hours pump service life the visual observation reveals the backside of the vane has entered the indicator hole, the next observation should be performed at 800 hours of pump service life.

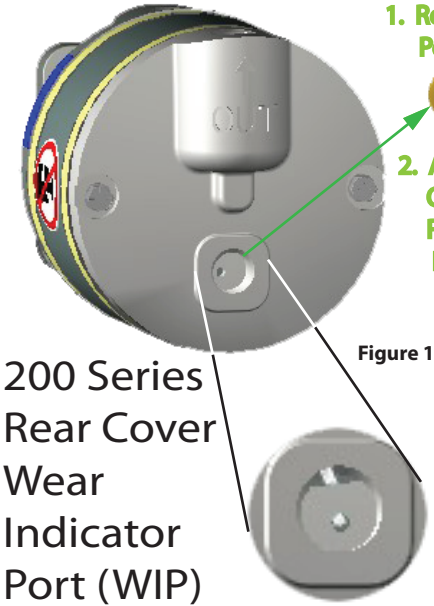


Figure 1

When observations reveal the end of the vane to be in the middle of the indicator hole, future observations should be performed at every one hundred (100) hours of service until the vane reaches the bottom 1/8 of the indicator hole.

To help prevent in-flight failure due to a critically short vane binding in a rotor slot, replace the pump when the end of the vane is observed in the lower 1/8 of the indicator hole.

Side Wear Port Indicator Instructions 240 & 400 Series

240, 400, AA240, AA400 Series Overhauled Dry Air Pumps with side WIP installed

Aero Accessories, Inc. has FAA approval to install its patented Side Wear Indicator Port in overhauled Airborne 240 & 400 series dry air pumps as well as on Aero Accessories AA240 & AA400 series overhauled dry air pumps.
Aero Accessories, Inc. recommends the 1st observation be conducted at 300 hours pump service, further observations should be conducted at intervals based on position of the Wear Indicator Tool's indicating bead.
Wear Indicator Ports make it possible to identify and remove pumps from service with vanes worn beyond their service life. Removing such pumps BEFORE THEY FAIL reduces the risk of in-flight failure and improves safety.
In addition to using the wear indicator port, always inspect the pump in accordance with the aircraft manufacturer's recommendations as well as for any other defects or conditions such as overheating (crinkled or burned decals), oil contamination, physical damage, looseness of parts and/or hardware, etc., that would render the pump unsuitable for continued service.
If any condition is discovered or suspected that would render the pump unsuitable for continuation in service, replace the pump, regardless of vane wear status.
Pumps incorporating the side WIP should be removed from service according to vane wear observations barring any other conditions that would indicate the necessity for earlier replacement.
The recommended TBO for 240, AA240, 400, or AA400 series pumps without the side WIP is 600 hours.
Aero Accessories, Inc. recommended Side Wear Port procedure begins on page 6. See Aero Accessories, Inc Service Letter SL-007 for further information, available on www.aeroaccessories.com

Failure of an air pump may result in the loss of the pneumatically powered gyro flight instruments and pneumatic deice equipment. IMC equipped aircraft should have a pneumatic or electric backup source in the event of the aircarft's primary pump fails

It is the pilot's / operator's responsibility to determine that the entire pneumatic system is in a safe, serviceable, and airworthy condition. Use the aircraft manufacturer's maintenance instructions and recommendations to determine the status of the entire pneumatic system.

Recommended Vane Wear Observation Intervals for AA240 & AA400 Series Dry Air Pumps:
1st Observation - 300 hours pump time-in-service.
Subsequent observations - each 100 hours time-in-service or at annual inspection, whichever comes first, after the initial observation.

Safety:
For increased safety, it is recommended to perform the vane wear inspection during procedures that require the spark plugs be removed, such as engine compression check.
NEVER move the propeller on a 'hot' engine.
ENSURE: Magnetos set to BOTH OFF. Fuel Mixture Closed. Fuel to OFF.
ALWAYS remain clear of the propeller's arc and ensure that other personnel do so.

Vane length measurement (Side WIP):

NOTE: in most cases, measuring the vanes can be done with the pump mounted on the aircraft. However, if the inspection port hole can not be accessed with the pump mounted, remove it from the engine, turn the pump's shaft by hand, and follow the same general instructions with respect to measuring the vanes. Reinstall the pump in accordance with instructions in the aircraft's maintenance manual.

a. "Safe The Engine"; remove the pump cooling shroud if necessary.

b. Insure the area around the inspection port plug is clean so that when the plug is removed nothing can fall into the pump.

c. Remove the Inspection Port Plug AND Star Washer, refer to Fig 2. Failure to remove the star washer will cause a false indication.

d. While looking into the indicator port, have an assistant slowly move the propeller by hand in the normal direction of rotation, until a vane slot is aligned precisely in the center of the port, refer to Fig 3. If you go too far, just keep turning to the next slot.

e. Insert the Vane Wear Indicator Tool , Fig 4, into the inspection port as illustrated in Fig. 5. Hold the barrel securely and squarely against the pump body. With your fingertip, gently push the plunger into the pump's inspection port. When the plunger touches the vane, slight vane movement may be felt if the vane is not at the bottom of its slot.

NOTE: If the plunger does not slip easily into the slot, DO NOT force it. Remove the indicator tool and check for correct alignment of the rotor slot to the port. (Refer to Figure 3.)

DO NOT rotate propeller or pump's shaft when the indicator tool probe is inserted in the inspection port. Doing so may break or chip the rotor. If the pump is turned with the probe in the pump, replace the pump even if you don't think it is damaged. A cracked of chipped rotor may operate normally for a while then fail without warning.

f. Observe the plunger's indicating bead land position. If the indicating bead's land is touching the barrel end, the vane is worn to the service limit. REPLACE the pump if any vane is at it's service limit.
(Refer to Figures 6-1, 6-2, 6-3.)

g. If the vanes are within service limit and the pump is otherwise serviceable, clean port plug threads, install Port Plug with a NEW STAR Washer and torque Plug to 45-50 inch-pounds.

DO NOT substitute a different screw or bolt for the plug. Use only the proper starwasher. The use of substitute parts can damage the pump.

Contact Aero Accessories, Inc. to obtain additional plugs and starwashers.

WIP Plug: 82-50122-2A1
Starwasher: 82-50122-2A2 or alternate AN936B-416 , MS35355-32, or MS35355-61

h. Attach the pump's cooling shroud if removed.

i. Enable the ignition system, If fuel was turned off turn it back on (assuming no other reason to leave it off).

j. Attach and secure cowling.

k. Perform a post maintenance run-up check to verify that the vacuum / pressure system, as well as any other system your work may have affected, is working properly.

Remove Port Plug AND
Starwasher

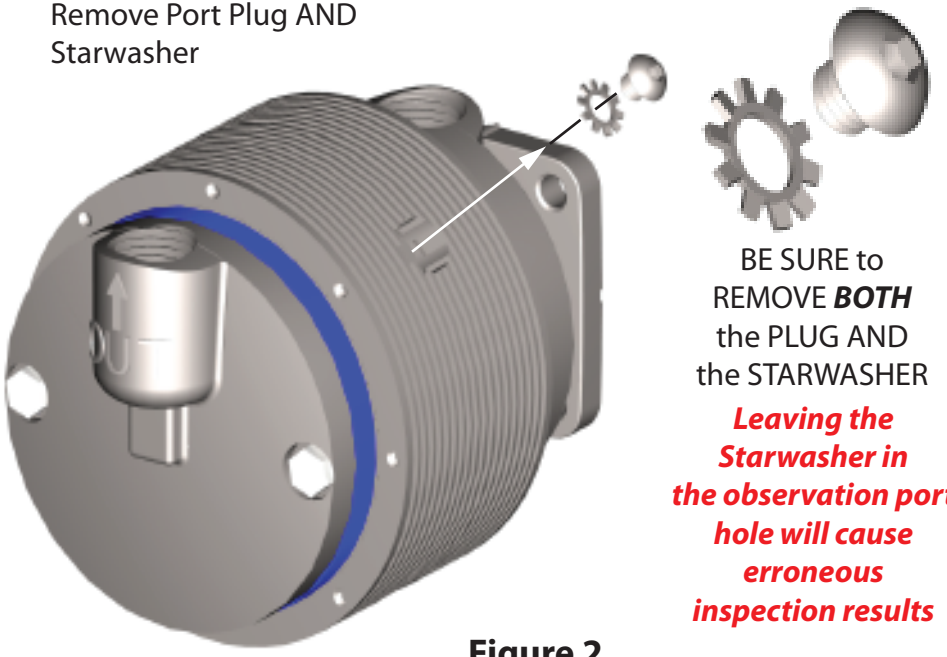
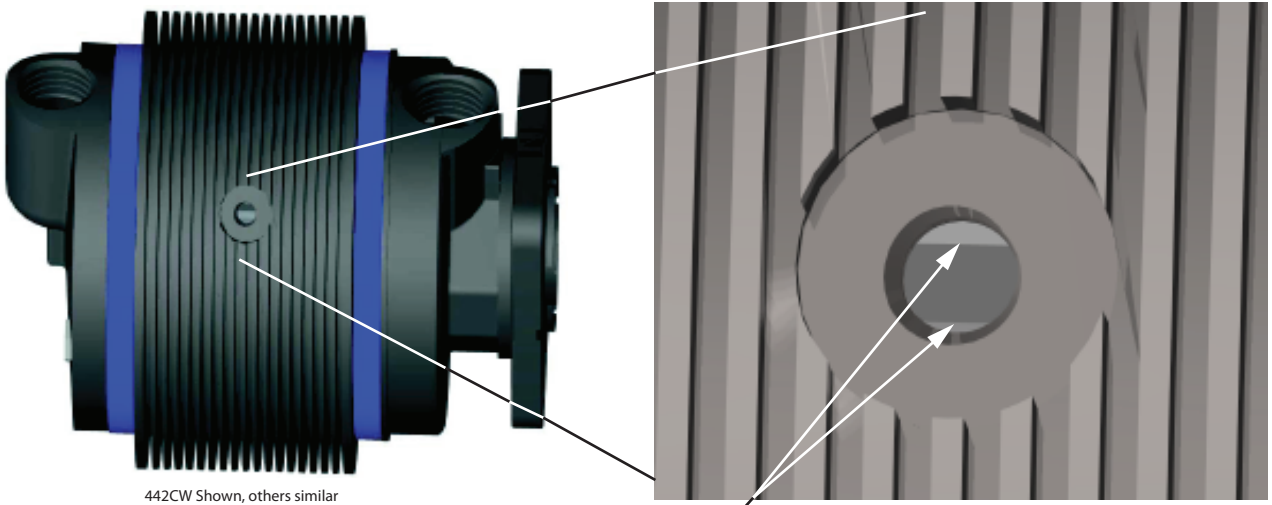


Figure 2

442CW Shown others similar

BE SURE to
REMOVE ***BOTH***
the PLUG AND
the STARWASHER

Leaving the Starwasher in the observation port hole will cause erroneous inspection results



442CW Shown, others similar

NOTE: Edges of rotor slot visible in inspection port hole

Figure 3

240 & 400 Series Wear Indicating Tool

P/N: 82-580122-2A6

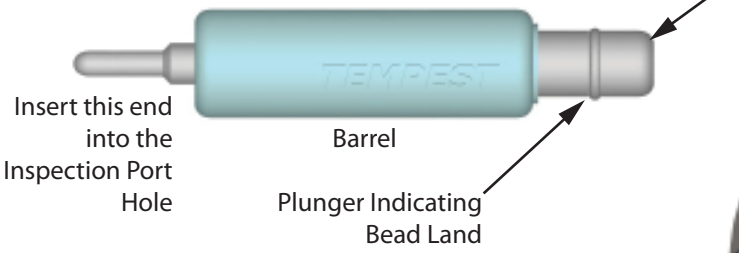
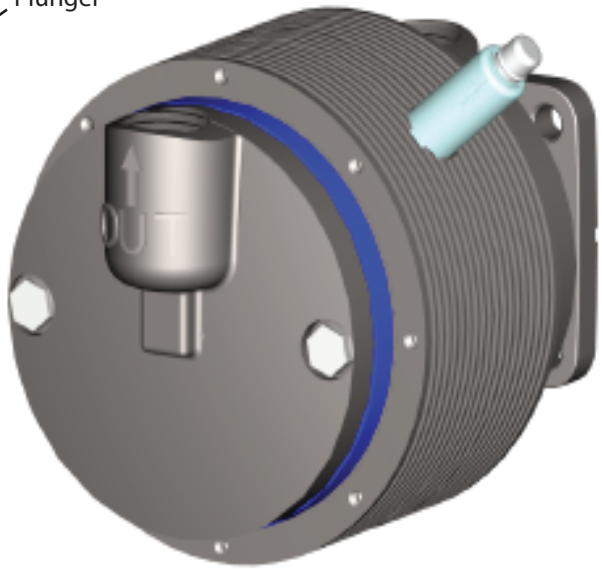


Figure 4

Figure 5



Wear Indicating Tool installed in Pump Inspection Port Hole

Figure 6-1

New Vane Indication

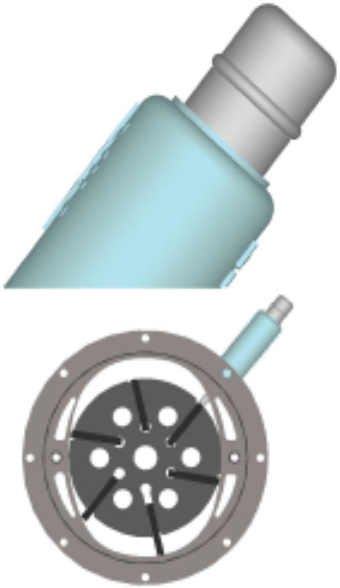


Figure 6-2

Vane still Good - Land not touching top of barrel

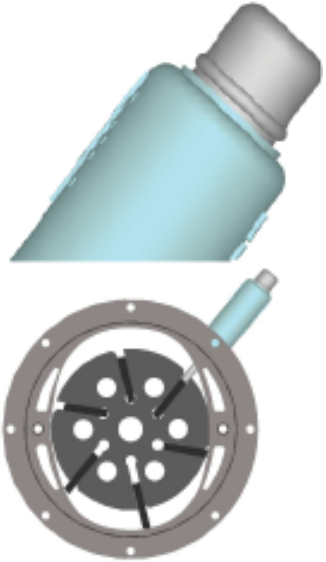
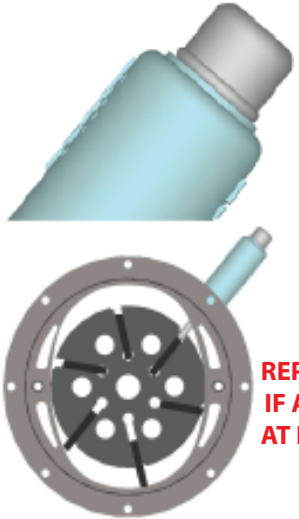


Figure 6-3

Indicating Bead Land TOUCHING Barrel: Vane at Service Limit REPLACE PUMP



REPLACE PUMP IF ANY VANE IS AT IT'S SERVICE LIMIT.

Pump sectinoal views - for reference only

LRT & Mounting Gasket Installation Guidelines

200, AA200, AA3200, 240, AA240, 400, AA400 Series Overhauled Dry Air Pumps

Dry Air Pumps overhauled by Aero Accessories may include our patented 'channel cut' in the mounting flange face. These, REQUIRE our patented LRT diverter and are designed to channel oil away from the dry air pump's mechanical workings if the drive pad's oil seal begins to leak. Pumps including the 'channel cuts' will also feature Fully Enclosed drive ends designed to eliminate oil and oil residues from entering the drive mechanism. Pumps without the flange face 'channel cut' DO not require and MUST NOT use the LRT diverter.

NOTE: The LRT Diverter is not a substitute for a mounting gasket. Mounting gasket 82-50130-B or 82-50130 must be used with the LRT properly installed.

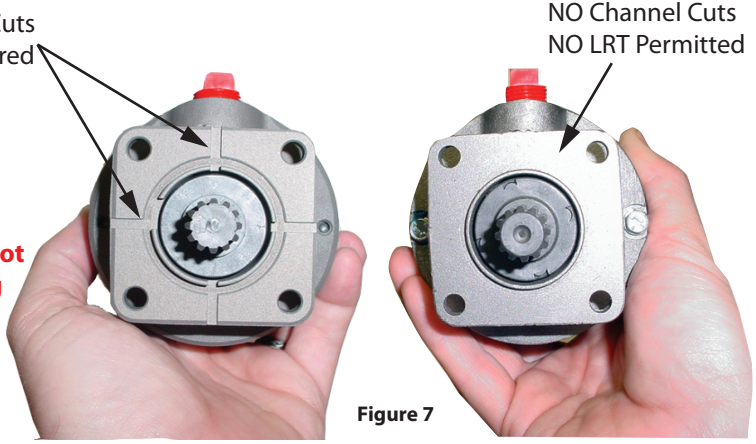


Figure 7

The 82-50130 gasket incorporates 8 small holes for accessories that require engine oil lubrication. The oil passage holes have been eliminated in the 82-50130-B mounting gasket. The LRT diverter is required on the Aero Accessories Dry Air Pumps New & Overhauled that have channels milled into their mounting flange faces. Either the 82-50130 or 82-50130-B gaskets can be used with the LRT diverter, however the '-B' gasket is preferred due to its increased sealing capability.

Refer to pages 17 & 18 for further amplification on LRT usage.

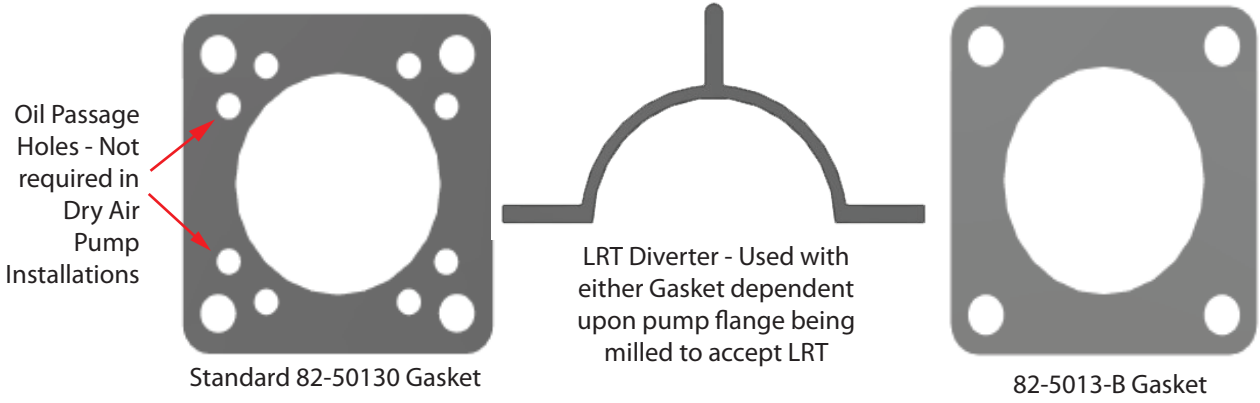

Oil Passage Holes - Not required in Dry Air Pump Installations
Standard 82-50130 Gasket
LRT Diverter - Used with either Gasket dependent upon pump flange being milled to accept LRT
82-5013-B Gasket

Figure 8

It is important that the LRT diverter is firmly inserted into the upper three (3) channels in the mounting flange face, with the middle leg of the LRT pointing UP, regardless of the pump inlet & outlet port orientation being vertical or horizontal and that the LRT be flush with the flange mounting surface before installing the mounting gasket. (As shown below.) Refer to pages 17 & 18 for further amplification of LRT usage.

NOTE: The LRT diverter is not a mounting gasket. Either the 82-50130 or 82-50130-B mounting gasket MUST be used with the LRT diverter when installing a Tempest Dry Air Pump with the mounting flange that has been machined to accept it. It is suggested that the 82-50130-B gasket be utilized in Dry Air Pump installations due to its increased sealing capability.

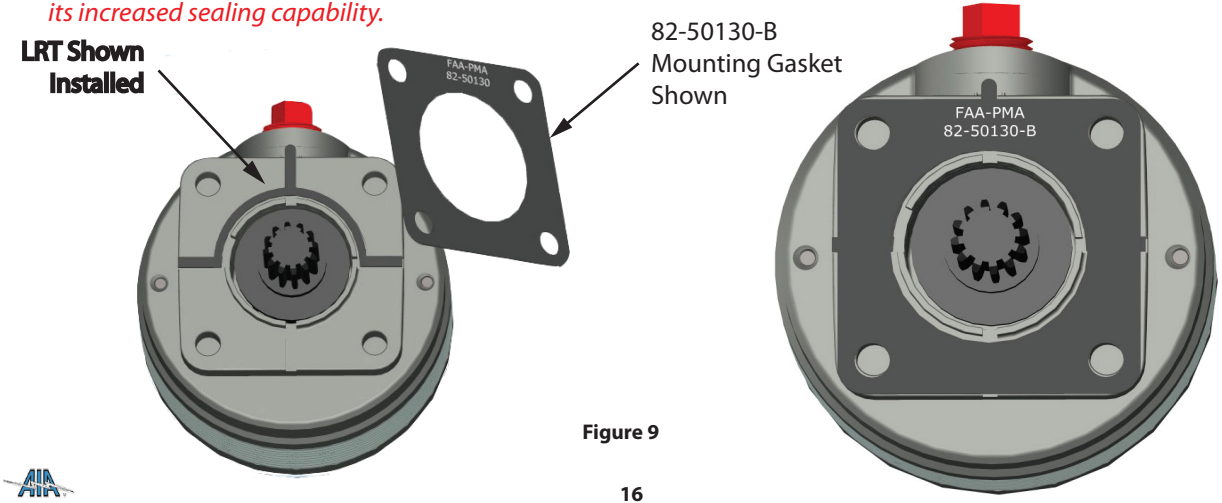


Figure 9

Most dry air pumps are installed with the inlet and outlet ports in the 12:00, 3:00, 6:00, or 9:00 positions. Tornado pumps have four (4) exit channels in the mounting flange face. When a pump is installed on an aircraft the three (3) upper-most channels MUST be plugged by the LRT diverter. The bottom channel is left open to allow oil to drain away from the pump's mechanical workings. In other words, the open, unplugged channel should be pointing towards the ground.

The photographs below and on the next page illustrate proper installation positions of the LRT diverter when the pump ports are at different positions.

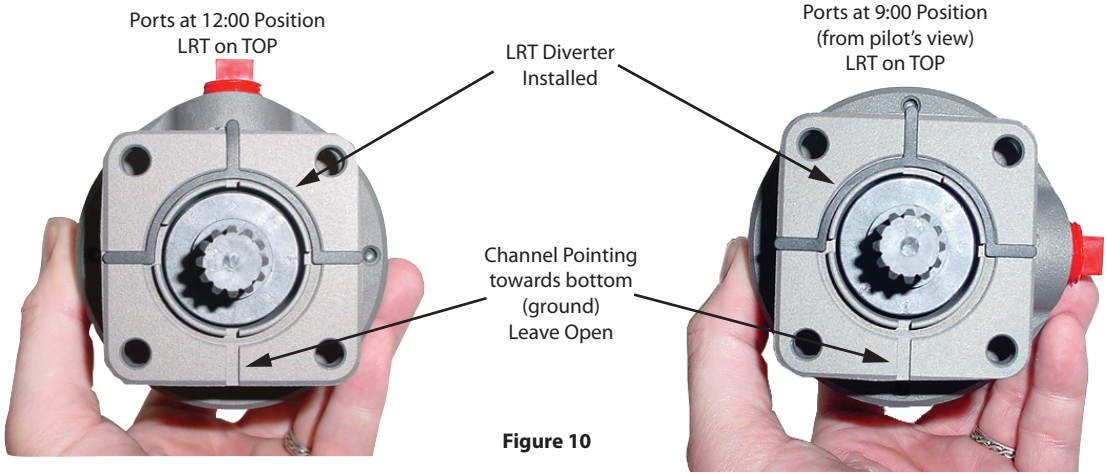


Figure 10

The photographs below show the inlet and outlet ports at the 6:00 and 3:00 positions. Notice that in both pictures the bottom channel is open and pointing towards the ground. The LRT diverter MUST be installed so that the lower drain channel of the mounting flange remains open and pointing towards the ground.

NOTE:

On Cessna 150 / Continental O-200 and some other engines the pump mounts with the drive shaft vertical. Pumps designed for vertical installation such as the AA3215CC-9, AA215CC-9, or AA211CC-9 are normally required. When installing an AA3215CC-9 the open channel should face aft towards the firewall and away from sources of oil contamination. On Cessna 172's having 2 pumps on the engine, the lower pump mounts with the ports slightly rotated at about 20 degrees. The channel pointing closest to the ground should be left open.

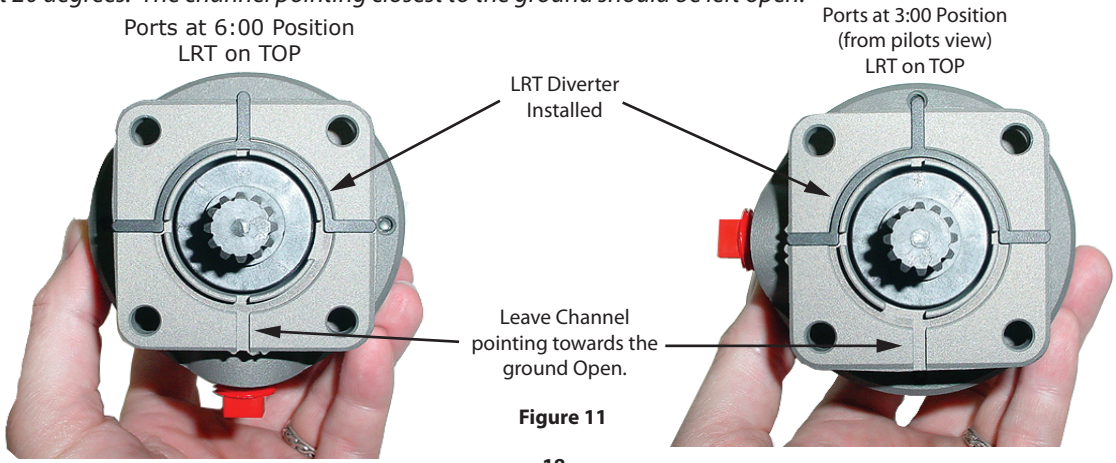


Figure 11

PNEUMATIC SYSTEM MAINTENANCE

A. Oil Leaks -

Inspect engine and engine compartment for oil leaks that could contaminate the dry air pump or reach the inlet filter on pressure systems or the vacuum regulator, if located in the engine compartment.

B. Oil Seal -

Inspect drive pad seal, it should be dry. If any oil is found replace the oil seal. (Refer to engine manufacturer's parts manual for correct seal part number and installation instructions.)

RECOMENDATION: *If a replacement pump is being installed on a midtime engine, replace the oil seal even if area is dry. The oil seal could start leaking before engine TBO is reached.*

C. Clean filters are essential for a pneumatic system to operate properly. Dirty filters can reduce air flow to pump causing the pump to operate at higher temperatures and increasing pump wear. Dirty filters can affect operation of pneumatic instruments and regulator(s) and can cause low vacuum or low or excessive pressure.

NOTE: REFER TO AIRCRAFT MAINTENANCE/SERVICE MANUAL FOR FILTER REPLACEMENT SCHEDULE.

D. Pump Fittings -

1. Inspect for damage and cleanliness.
2. Bent or kinked fittings (Figure 12) can reduce air flow.
3. Check threads for damage, replace if necessary.
4. Clean fittings inside and out to remove any loose debris.
5. Install fittings as described in Section 'Dry Air Pump Installation'.

Figure 12

E. Hoses -

Remove and inspect hoses for the following conditions;

1. Hard, Cracked, Brittle, or Oil Contaminated.
2. Determine if liner separation has occurred inside of hose. Liner separation can restrict air flow.
   (Replace hose if any one of these conditions is found.)
3. If replacing a previously failed pump, throughly clean inside of hoses , making sure all loose debris have been removed before attaching hoses.

NOTE: PUMPS INTERNAL CLEARANCES WILL NOT ALLOW FOREIGN PARTICLES TO PASS THOUGH WITHOUT CAUSING DAMAGE OR FAILURE. MAKE SURE HOSES ARE CLEAN.

F. Vacuum Regulator -

Regulator must be clean, oil free and in airworthy condition for proper operation. Replace regulator filter after installing new pump or every 100 hours or annually.

Run engine and check for proper operation of regulator. (Refer to Aircraft Service / Maintenance Manual) adjust as necessary for correct vacuum setting for your aircraft. (*Tempest™ Regulators should require no field adjustment, contact Aero Accessories, Inc. if a Tempest™ regulator gives an indication of improper operation.*)

G. Regulator, Valves and Deice Valves -

Before installing a replacement dry air pump, particularly if old pump has failed prematurely, the following guidelines must be accomplished.

1. Determine if pnuematic system problem was cause of failure. This can be accomplished using a commercially available test kit. (Contact Aero Accessories, Inc. for test kit information.)
2. Test aircraft's pneumatic system according to outlined instructions supplied with test kit and the Aircraft Service / Maintenance Manual.
3. Any regulator, valve or deice valve found to be defective must be replaced in accordance with the Aircraft Service / Maintenance Manual to prevent possible premature failure of new pump after installation on aircraft.

H. Manifolds / Check Valves -

Manifolds and check valves have internal rubber components that can deteriorate from age becoming hard and brittle, and lose their sealing capacity. (Refer to Aircraft Service / Maintenance Manual for manifolds, check valves inspection intervals and procedures.)

CAUTION: AIRCRAFT WITH DUAL DRY AIR PUMPS MAY LOSE REDUNDANCY FEATURE IF THE MANIFOLD / CHECK VALVE IS NOT FUNCTIONING PROPERLY.

DRY AIR PUMP INSTALLATION -

1. Before installing replacement pump, confirm it is the correct model for the application.

2. Perform maintenance check of fittings, hoses, regulator(s) and filters.

NOTE: If previous pump has failed prematurely, perform maintenance system check to insure all components of the pneumatic system are functional and working correctly.

3. With replacement pump gripped by the mounting flange in vise (Fig. 13) install fittings into ports finger-tight. ***(Use NO Pipe Sealant or Tape on threads.)*** Tighten with proper wrench, no more than one (1) full turn to required position.

Do Not grip pump by the sides of the pumping chamber (Fig. 14).

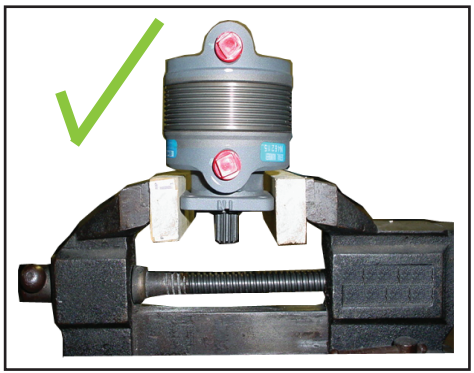


Figure 13

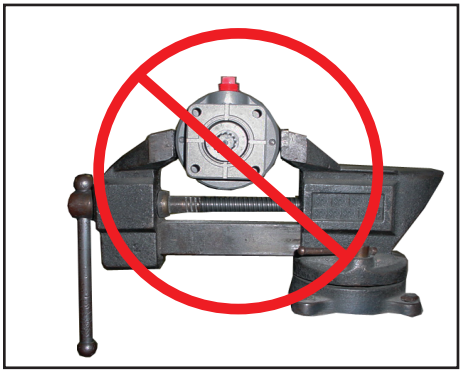


Figure 14

4. Install pump with new mounting gasket and, if required a LRT Diverter.
5. Secure pump with proper mounting hardware and tighten. (Refer to Aircraft Engine Service / Maintenance Manual for specified torque requirements.)
6. Attach hose to correct fittings, being careful not to cut the I.D. of the hoses when sliding over end of fittings. Secure hoses with proper hardware.

CAUTION: WHEN INSTALLING PUMP FITTINGS, SECURE PUMP IN VISE BY DRIVE END PAD AS SHOWN IN FIG. 13. SECURING PUMP BY PUMPING CHAMBER, FIG. 14, COULD AFFECT INTERNAL CLEARANCES CAUSING PUMP FAILURE.

FINAL SYSTEMS CHECK -

After new pump is installed and secured, before running engine to check pneumatic system, inspect all hoses, filters, and regulator(s) for proper installation.
Run engine(s) and check operation to verify that pneumatic system is operating within aircraft specifications. (Refer to Aircraft Service / Maintenance Manual.)

!!! IMPORTANT POINTS ABOUT DRY AIR PUMPS !!!

1. Dry Air Pumps are just that, INTERNALLY DRY. Dry air pumps use the graphite dust produced by the gradual wear of the internal vanes as lubrication. Any oil leak, however slight, that permits oil to reach the drive end of the pump may cause internal oil contamination. This contamination combines with the lubricating dust and forms a gummy mixture that binds up the internal components of the pump leading to failure.

2. When cleaning an engine with solvent or soap and water, use a waterproof material to cover the entire dry air pump(s), the pneumatic air filter and regulator(s). Contamination from solvent or water saturation of these areas may be ingested into the pump causing failure in the much the same way as oil contamination.

3. When a pump fails, vacuum that is present in the inlet hose may suck small particles of carbon up into the hose, even as far as the regulator. (Pressure systems, the inlet filter will become contaminated.) Hoses and regulator(s) should be removed throughly cleaned and filters replaced. Particles from the previous failed pump can contaminate the replacement pump and cause FOD damage leading to failure.

4. Teflon tape or other thread compound on threaded fittings or port threads may be ingested into the pump. These substances will bind up lubrication dust and cause FOD damage leading to failure. It is not necessary to use any type of sealant on fitting threads or port threads.

NOTE: More than 95% of dry air pump failures are the result of one or more of the above points!

Overhauled Dry Air Pump Warranty:

Dry Air Pumps overhauled by Aero Accessories, Inc. are warranted against defects in materials and/or workmanship for the time periods listed below by model/series number. Aero Accessories, Inc. obligation under this warranty is limited to the repair or replacement at Aero Accessories, Inc. sole descretion any pump that upon inspection by Aero Accessories, Inc is found to be defective in materials or workmanship.

211,212,215,216,3215,3216 & -9 Mods	**2 years or 1000 Hours from Time of Installation**
241,242 All - Models	**1 year or 400 Hours from Time of Installation**
441, 442 All - Models	**1 year or 400 Hours from Time of Installation**

Aero Accessories, Inc.
1240 Springwood Avenue Gibsonville , N.C. 27249 Tel.- 336-449-5054 800-322-3200 Fax.-336-449-5461
Tempest Overhauled Dry Air Pumps are overhauled by Aero Accessories, Inc. in the USA